

Nondestructive Examination (NDE) Technology and Codes
Student Manual

Volume 1

Chapter 2.0

Personnel Qualification and Certification

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2.0 PERSONNEL QUALIFICATION AND CERTIFICATION

Learning Objectives:

To enable the student to:

1. Understand the differences between centralized certification and employer-based certification.
2. Understand the requirements of various NDE certification programs, including common U.S. based systems and international systems.
3. Identify the salient features of the Nuclear Power Industry Performance Demonstration Initiative.

2.1 Qualification vs. Certification

NDE is a discipline that requires formal training and on-the-job experience to develop an individual that is capable of properly performing the examination and obtaining meaningful results. Users of NDE services need assurance that the individual performing NDE has the qualifications necessary to detect the conditions of interest in a predictable, consistent manner.

The certification system has been adopted by industry to provide that assurance. Certification is not to be confused with qualification. Qualification is the ability of an individual resulting from education, training, and experience to perform an NDE correctly. Certification is written testimony that the individual has the proper

qualifications and meets some minimum standard of education, training, and experience.

A number of certification systems have been developed for use by U.S. industries. The American Society for Nondestructive Testing (ASNT) has developed several systems for the certification of NDE personnel. The American Welding Society has also developed a system of certifying individuals involved in the examination of welds. Other organizations have developed certification systems that are tailored to meet their specific needs.

Those certification systems have certain common features. They include:

- Prescribed minimum levels of formal education,
- Prescribed minimum levels of formal training for each of the NDE methods,
- Prescribed minimum levels of experience, and
- Some form of examination or demonstration of proficiency.

2.2 Employer-Based Certification vs. Centralized Certification

There is some discord in industry regarding employer-based certification versus centralized certification. ASNT has developed an employer-based system for the certification of NDE personnel. Each employer is responsible for the certification of their NDE personnel in accordance with their own procedure, which is based on SNT-TC-1A or CP-189.

The Europeans have a different philosophy and have developed centralized certification programs where the NDE technician is certified by a National Certifying Body (NCB).

The employer-based certification system is typically tailored to meet a company's specific needs. That is, the certification can be job or product specific. The certification is only valid as long as the individual is employed by that company.

Each of the centralized certification systems have standardized requirements for certification. Compared to employer-based certification systems, the centralized certification systems may require the candidate to have more formal training and experience. The centralized certification systems require the individual to have a thorough understanding of the NDE method and broad based experience. The benefit for the NDE technician is that the certification is issued by a recognized body or organization (e.g., NCB). Centralized certification allows the individual to carry the certification to a new company when changing employers.

2.3 Employer-Based Certification

Two ASNT certification systems are employer-based and used by U.S. companies that are involved with commercial nuclear reactors and power plants. These systems are the ASNT Recommended Practice SNT-TC-1A and the ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel CP-189. These documents are referenced in various ASME Code sections.

2.3.1 SNT-TC-1A

SNT-TC-1A is a document that provides recommendations for the qualification and certification of NDE personnel. SNT-TC-1A was first published in 1967 and has been revised over the years to address the changing needs of industry. This recommended practice provides a framework for each employer to develop his own procedure or "Written Practice" for the qualification and certification of NDE personnel within his organization.

The employer is permitted to modify the recommendations of SNT-TC-1A. The employer's Written Practice describes in detail how the employer provides for the qualification and certification of their NDE personnel. The Written Practice is the key element to the employer-based certification system.

Each company must have a Written Practice that is unique to its organization; therefore, it is important that the company's Written Practice be reviewed in advance. Some companies that provide NDE services have very sound qualification and certification programs. A great deal of effort is expended for training and upgrading of its personnel. Other companies may have limited resources and minimize the efforts expended for the certification of their employees. A thorough review of each company's Written Practice is a primary way of determining the strength of a company's commitment to providing adequate training, qualification, and certification for their NDE personnel.

SNT-TC-1A describes three categories of

qualification for individuals engaged in NDE.

Level I - An NDE Level I individual has met the minimum requirements (i.e., formal training and experience) for Level I certification. A Level I individual should be qualified to properly perform specific calibrations, specific NDE, and specific evaluations for acceptance or rejection determinations according to written instructions and to record the results. The Level I should receive guidance from a certified Level II or III individual.

Level II - An NDE Level II individual should be qualified to set up and calibrate equipment and to interpret and evaluate results with respect to applicable codes, standards, and specifications. The NDE Level II should be thoroughly familiar with the scope and limitations of the methods for which he/she is qualified and should exercise assigned responsibility for on-the-job training and guidance of trainees and NDE Level I personnel. The NDE Level II should be able to organize and report the results of NDE.

Level III - An NDE Level III individual should be capable of developing, qualifying, and approving procedures, establishing and approving techniques; interpreting codes, standards, specifications, and procedures; and designating the particular NDE methods, techniques, and procedures to be used. The NDE Level III should be responsible for the NDE operations for which qualified and assigned and should be capable of interpreting and evaluating results in terms of existing codes, standards, and specifications. The NDE Level III should have sufficient practical background in applicable materials, fabrication,

and product technology to establish techniques and to assist in establishing acceptance criteria when none are otherwise available. The NDE Level III should have a general familiarity with other appropriate NDE methods, as demonstrated by the ASNT Level III basic examination or other means. The NDE Level III, in the methods in which certified, should be capable of training and examining NDE Level I and II personnel for certification in those methods.

It should be noted that the “trainee” is described as “an individual who is in the process of being trained, qualified, and certified.

Level I, II and III personnel must be recertified periodically depending on the code edition and specification. SNT-TC-1A 2001 or earlier requires Level I and II technicians to recertify every three years and level III technicians to recertify every five years. The 2006 edition allows for all to recertify at five year intervals.

SNT-TC-1A has served as the foundation for a number of other certification schemes. CP-189, NAS-410, MIL-STD-410, and others use the same descriptors for levels of certifications.

2.3.1.1 Benefits of SNT-TC-1A

SNT-TC-1A offers industry a number of benefits. The significant benefits include:

- It requires employers to analyze their position on certification and the documentation of their program.
- Through the Written Practice, the employer has an implied responsibility

to train and formally examine NDE personnel.

- It implies customer responsibility to review and evaluate the Written Practice to ensure its adequacy with respect to the Terms and Conditions
- It provides a basic certification approach that can be referenced in contracts or purchase orders.
- If the qualification concept is followed, it will result in significant training activity and personnel development in preparation for certification.
- It offers the employer the flexibility to modify (i.e., by either increasing or reducing) the certification requirements to meet specific needs.

2.3.1.2 Limitations of SNT-TC-1A

SNT-TC-1A is a recommended practice. As such, an employer can apply the recommendations of SNT-TC-1A in its entirety, or increase/reduce the recommendations to suit the company's purpose.

The result is that most companies have different Written Practices for the certification of their NDE personnel. This can cause difficulties for organizations that purchase NDE services and requires careful evaluation by the purchaser.

The Written Practice is key in determining the level of competency of the personnel performing NDE. Unfortunately, many companies that require the services of an NDE provider do not adequately review the Written Practice and personnel documentation to determine if the company's needs will be met.

Since SNT-TC-1A is an employer-based certification system, the individual's certifications are terminated upon leaving the company.

It is the new employer's responsibility to recertify new personnel. This can be an expensive undertaking for a small company that may employ NDE personnel on a short-term contract basis.

The certification process entails several key steps. An outline of the certification process is as follows:

- The employer must develop a Written Practice for the qualification and certification of NDE personnel.
- The employer must verify that the candidate has met the education, training, and experience for the specific method for which certification is sought.
- The candidate must be tested to verify that the knowledge and skills required for certification exist. This is a multistep process consisting of the following tests:
 - General knowledge of the examination method,
 - Specific knowledge of the method as applied to the specific products,
 - Practical application of the examination method (e.g., hands-on demonstration),
 - Vision test to verify that the candidate meets the physical requirements of the job, this includes an **annual** near vision test and color vision tests every five years.

A review of the definitions of each certified level indicates that the Level III individual is responsible for the administration of the NDE program within a company. Therefore, the strength of the company's NDE program is greatly dependent on the competency of the Level III.

SNT-TC-1A permits a Level III to be certified in one of the following ways:

Examination - An employer can develop and administer the Level III tests. The questions must be approved by a qualified person.

Outside agency - An employer can contract with an independent outside agency that would develop and administer the tests.

ASNT - The employer can accept the results of ASNT administered tests as totally or partially satisfying test requirements as defined on the company's Written Practice.

Grandfathering - For a six month period from September 1976 to February 1977, applications for Level III grandfathering were accepted by ASNT. (Over 700 individuals were granted an ASNT Level III certificate through this process).

The ASNT Level III certificate offers wider recognition and a degree of portability. Still, it must be understood that each employer must

certify their own NDE Level III personnel. ASNT does not certify the individual under the SNT-TC-1A system.

A complete review of the certification documentation for each individual to provide NDE services is essential.

SNT-TC-1A recommends certain documentation be maintained for each certified individual. This documentation should be available for review by their customers or agencies. Therefore, it is essential that a thorough customer review of the Written Practice, certification records, and the supporting qualification data be completed. SNT-TC-1A recommends the maintenance of the following for each certified employee:

- Name of the certified individual,
- Level of certification and NDE method,
- Educational background and experience,
- Statement of satisfactory completion of training in accordance with the employer's Written Practice,
- Results of vision tests,
- Current test copies or evidence of successful completion of examinations,
- Other suitable evidence of satisfactory qualifications,
- Examination grades or a written statement where tests were administered by an outside agency or ASNT,
- Dates of certification and/or recertification, and dates of assignment to NDE, and
- Signature of the employer's certifying authority.

- Certification expiration date.
- Signature of the Level III that verified the qualification of the candidate for certification.

The employer-based system of certification has been in use for many years. The effectiveness of the “certification” is only as good as the company’s commitment to the NDE program.

2.3.1.3 Terminology

SNT-TC-1A (2006 Edition) includes a glossary of terms relating to the certification process that has been adopted by the NDE industry. Some of the common terminology is defined as follows:

- Certification is written testimony of qualification.
- Certifying Authority is the person or persons properly designated in the Written Practice to sign certifications on behalf of the employer.
- Certifying Agency is the employer of the individual being certified.
- Closed-book examination is an examination administered without access to reference material, except for materials supplied with or in the examination.
- Comparable is being at an equivalent or similar level of NDT responsibility and difficulty as determined by the employer’s Level III.
- Documented is the condition of being in written form.
- Employer is the corporate, private, or public entity which employs personnel for wages, salary, fees, or other considerations.
- Experience is the work activities accomplished in a specific NDT method under the direction of qualified supervision including the performance of the NDT method and related activities but not including time spent in organized training programs.
- Limited Certification is the restriction of a method to a technique or a subdivided method that meets the employer’s use of a limited scope of a particular NDE method.
- Outside Agency is a company or individual who provides NDE Level III services and whose qualifications to provide these services have been reviewed by the employer engaging the company or individual.
- Qualification is demonstrated skill, demonstrated knowledge, documented training, and documented experience required for personnel to properly perform a specific NDE method.
- Recommended Practice is a set of guidelines to assist the employer in developing uniform procedures for the qualification and certification of NDE personnel to satisfy the employer’s specific requirements.
- Training is the organized program developed to impart the knowledge and skills necessary for qualification.
- Written Practice is the document which provides guidelines for the establishment of a qualification and certification program.

2.3.2 ASNT Standard for Qualification and Certification of NDE Personnel (ANSI/ASNT CP-189)

Since SNT-TC-1A is a “recommended practice” or a set of guidelines, the variability in company’s written practices has been a major problem. ANSI/ASNT CP-189 is a national consensus standard that addresses the uniformity missing in employer based certification programs.

CP-189 is based on SNT-TC-1A, however CP-189 stipulates the minimum requirements of a certification Program. It establishes minimum requirements for education, training, experience, and examinations that must be met to be considered for certification.

The employer is required to have a certification procedure that must meet the minimum requirements for training, experience, documentation, tests etc. as prescribed in CP-189. The employer cannot deviate from the minimum certification requirements as was permitted under SNT-TC-1A.

The standard describes five levels of qualification instead of three. The five levels are:

- Trainee,
- Level I,
- Level II,
- Level III, and
- NDE Instructor.

The descriptions and responsibilities of the Trainee, Level I, Level II, and Level III are similar to those contained in SNT-TC-1A.

NDE training must be provided by a qualified instructor. One requirement for the instructor includes a current ASNT Level III certificate in the method being instructed. If the instructor does not have an ASNT Level III certificate, then a four year degree in engineering, science, or technology, and an adequate knowledge of the method being taught is acceptable. If the instructor has a two year degree in engineering, science, or technology and five or more years of experience as a Level II or equivalent is required. An individual with a high school diploma must have at least ten years NDE experience as a Level II or equivalent in the method being taught.

The certification and supporting documentation requirements closely parallels those of SNT-TC-1A.

Also, like SNT-TC-1A, an individual’s certification is terminated when employment is terminated and may also be terminated for cause. Level I, II and III NDE personnel must be recertified every five years.

CP-189 offers the industry an employer-based certification standard that addresses many of the perceived weaknesses of SNT-TC-1A.

CP-189 requires each employer to have a Level III that holds a valid ASNT Level III certificate. The services of an outside agency may be retained to provide Level III Services if

the employer does not have an on-staff ASNT Level III certificate holder.

Section V of the 2007 Edition with 2008 Addenda of the ASME Code requires that NDE personnel be qualified in accordance with either the 2006 Edition of SNT-TC-1A, or the 2006 Edition of ANSI/ASNT CP-189, or ASNT ACCP. It further states that qualifications in accordance with an earlier edition of SNT-TC-1A, CP-189 or ACCP be considered valid until the individual is recertified. The recertification must be in compliance with SNT-TC-1A (2006), CP-189 (2006) or ACCP.

Section XI of the 2007 Edition of the ASME Code requires each employer to prepare a written practice (or certification procedure) in accordance with CP-189 1995. It also requires that personnel performing NDE be qualified and certified using that written practice, which is in accordance with CP-189. It permits existing certifications based on earlier editions of CP-189 to remain valid until recertification, which must then be in accordance with the 1995 Edition of CP-189.

Section XI amends two provisions in CP-189 as follows:

1. Levels I and II are required to be recertified every five (5) years in lieu of the three (3) years specified in CP-189. The Level III recertification is at five (5) years intervals as required in CP-189.
2. CP-189 requires the possession of a Level III certificate issued by ASNT, as a prerequisite to employer Level III recertification.

Section XI waives this prerequisite, thereby permitting Level III qualification to be through the employer examination process or by ASNT examination. Also, the employer has the option of using an outside agency to administer the examinations.

2.3.3 Qualification of Personnel for Visual Examination

Section XI also requires compliance to Appendix VI for the training, qualification, and certification of visual examination personnel. This mandatory appendix requires the preparation of a written practice in accordance with ANSI/ASNT CP-189 with the following specific and/or additional requirements:

1. Experience as specifically defined for the VT-1, VT-2, and VT-3 categories (reference Appendix VI-4110 of Section XI).
2. Specific subjects must be included in the VT training program (reference Appendix VI Supplement 1 of Section XI).
3. Examinations for Level I, II, and III personnel must be approved, administered, and graded by a Level III.
4. A passing grade of 80% is required for each examination rather than the minimum of 70% permitted by CP-189.
5. If an examination is failed, the candidate must receive additional training as determined by the Level III. The examination questions to be used for the

reexamination must contain at least 30% new or reworded questions.

The practical or Demonstration Examination test specimens set must contain at least 50% different flaws than those use on the examination that was failed.

These additional or supplemental requirements contained in Article VI must be reflected in the employer's written practice.

2.3.4 Qualification Requirements for Ultrasonic Examination Personnel

Section XI contains a mandatory Appendix (VII) for the qualification of Ultrasonic Examination personnel. This appendix contains additional or supplemental requirements to those in CP-189 including:

1. Minimum hours of experience as defined in Table VII-4110 are greater than those required by CP-189, for all three levels.
2. Detailed experience records must be maintained by the employer and a Level III is responsible for reviewing the documentation to determine if it meets the employer's written practice requirements.
3. The NDE instructor must have completed a 40-hour course in training and teaching techniques, or have a current certificate for teaching/instructing.
4. Specific training course subjects are contained in Supplement 1 to appendix VII.

5. Table VII-4220-1 contains details regarding initial training which includes:

Level	Classroom	Laboratory
I	40 hrs	40 hrs
II	40 hrs	40 hrs
III	40 rs	0

6. A grade of 70% is necessary to receive credit for the training unless a qualification examination is given at the conclusion of the training.
7. If the course examination is failed, additional training in those areas of weakness, as identified in the examination, must be administered.
8. There is also a ten (10) hour (minimum) supplemental training requirement that must be given annually.
9. Requirements for examination questions and test specimens for the Practical Examination are extensive and are detailed in VII-4310. Level I and II qualification examinations are described in VII-4320 and, Level III Qualifications are contained in VII-4330.

Appendix VIII contains the requirements for Ultrasonic Examination system performance demonstration.

2.4 ISO 9712 Central Certification

An internationally recognized standard for centralized certification is ISO 9712, Nondestructive Testing—Qualification and

Certification of Personnel. This international standard establishes a system for the qualification and certification of personnel that are engaged in “industrial” NDE. This standard provides for the certification of individuals through a central independent body that is referred to as the Certification Body (CB).

The system employs test centers to administer tests for certification. This is in contrast to employer-based certification where each employer administers his own certification tests. The concept of centralized certification standardizes the requirements for the qualification and certification of the NDE personnel. It affords a greater degree of transportability of an individual’s NDE credentials.

The CB is described as the agency that complies with EN45013, and administers procedures for certification of NDE personnel in accordance with the requirements of ISO 9712. The requirements that are needed in order to be a CB include the following:

- It must be a non-profit organization.
- It shall have no direct involvement in training of NDE personnel.
- It must be recognized by the NDT community or the International Organization for Standardization (ISO) member body of the country concerned.
- It must initiate, maintain, and promote the national certification scheme.
- It will administer the procedures for certification.

- It will have a stringent code of ethics.
- It will be ultimately responsible for the certification scheme, including technical and administration requirements.
- It will approve examination centers and monitor them on a periodic basis.
- It will be responsible for and maintain all appropriate records.

Examination Centers must meet the following requirements:

- Established by the CB;
- Adequate qualified staff, facilities, and equipment;
- Use only examinations and documents established and/or approved by the CB; and
- Use only specimens prepared or approved by the CB for the practical examinations.

The program does not require the employer to have a written practice or procedures describing the system of qualification and certification. The fact that a company endorses the ISO program includes all the requirements stipulated by ISO 9712.

The training requirements included in ISO 9712 are somewhat different than those of SNT-TC-1A and CP-189. Table 2-1 compares the training stipulated in SNT-TC-1A, CP-189, and ISO 9712 programs.

Likewise, the experience requirements of ISO 9712 differ from those of either SNT-TC-1A or CP-189. The experience requirements are reduced if the candidate has earned a degree in

NDE from a college or university. Table 2-2 compares the experience stipulated in the three programs.

2.4.1 Terms of Certifications

All ISO 9712 certifications are valid for a period of five years. The certifications are terminated if:

- The individual moves on to a different industrial sector (e.g. shipbuilding to petrochemical);
- Unethical behavior is found
- A physical disability occurs
- A physical disability that prevents the certified individual from performing work activities
- The individual fails to meet the visual acuity requirements.
- The individual experiences a significant interruption in examination performance.

2.4.2 Renewal

Certification can be renewed for a second five year term when there is evidence of:

- Satisfactory vision test every twelve months and;
- Continued satisfactory work activity without significant interruption.

2.4.3 Recertification

Recertification is required on the tenth anniversary. Recertification is accomplished by the satisfactory completion of a simplified written test (Level III) or a practical test (Level I and II.)

The examination consists of;

2.5 ASNT Central Certification Program (ACCP)

ACCP builds upon the existing ASNT Level III certification program. In addition to passing the ASNT administered written tests; the Level III candidate also must pass a hands-on Level II demonstration of proficiency and a written procedure preparation examination.

The ACCP provides a transportable certification and ultimately will provide central certification for Level I, Level II, and Level III NDE personnel.

Examination centers will be approved and located to support the program geographically.

The certifications will be industry specific and recertification will be required when working in a different industry sector.

2.6 AWS Certification of Welding Inspectors (CWI)

The American Welding Society has a central certification program for the certification of welding inspectors. The program is the QC-1, Standard for AWS Certification of Welding Inspectors.

The program requires the candidate to provide documented evidence of visual welding inspection or related work experience, and it requires the successful completion of a three part examination.

- General Knowledge—written

- Specific—code interpretation – written and;
- Practical—hands on demonstration of visual inspection of test samples

There are three levels of certification

- Certified Associate Welding Inspector (CAWI)
- Certified Welding Inspector (CWI)
- Senior Certified Welding Inspector (SCWI).

The QC-1 program offers a certification scheme that is independent of the employer and is, therefore, completely portable.

The certification must be renewed every three years by providing documented evidence of continued examination or related activities. Every nine years, recertification is by testing.

2.7 Supplemental Qualification Requirements

The power utility industry has adopted supplemental programs for the qualification and certification of Visual Examinations and Ultrasonic Examination personnel. The requirements of these programs are contained in Appendix VII (UT) and Appendix VI (VT) of Section XI of the ASME Boiler and Pressure Vessel Code.

As discussed in 2.3.3, Section XI requires NDE personnel to be qualified and certified in accordance with the requirements of CP-189. Individuals engaged in ultrasonic examination must also meet the requirements of Appendix VII that describes the supplemental requirements for the qualification and certification of Ultrasonic NDE personnel.

Visual examiners must also meet the supplement requirements of Appendix VI that describes the supplemental requirements for the qualification and certification of Visual Examination Personnel.

Note that the ASME differentiates between inspection and examination. Inspections are performed by Authorized Inspectors and Owner's Representatives. Examinations and tests are performed by the manufacturer (e.g., fabricators, installers, etc). Therefore, the ASME refers to NDE rather than nondestructive testing (NDT).

Table 2-1 Training Hours¹

	SNT-TC-1A, 2006²	CP-189-2006³	ISO 9712⁴
Eddy Current Examination			
Level I	40	40	40
Level II	40	40	40
Penetrant Examination			
Level I	4	4	16
Level II	8	8	24
Magnetic Particle Examination			
Level I	12	12	16
Level II	8	8	24
Radiographic Examination			
Level I	40	40	40
Level II	40	40	80
Ultrasonic Examination			
Level I	40	40	40
Level II	40	40	80
NOTES: 1. Recommended for high school graduate. 2. Training for Level III personnel not specified in SNT-TC-1A. 3. CP-189 training for Level III personnel is considered satisfied by the possession of an ASNT Level III certificate. 4. ISO 9712 does not specify training hours for a Level III.			

Table 2-2. Recommended Experience Time

	SNT-TC-1A, 2006	CP-189-2006	ISO 9712-92
	Hours/Months	Hours	Months
Eddy Current Examination			
Level I	210*/400**	210*/400**	3
Level II	630*/1200**	630*/1200**	9
Level III	***	***	***
Penetrant Examination			
Level I	70*/130**	70*/130**	1
Level II	140*/270**	140*/270**	3
Level III	***	***	***
Magnetic Particle Examination			
Level I	70*/130**	70*/130**	1
Level II	210*/210**	210*/400**	3
Level III	***	***	***
Radiographic Examination			
Level I	210*/400**	210*/400**	3
Level II	630*/1200**	630*/1200**	9
Level III	***	***	***
Ultrasonic Examination			
Level I	210*/400**	200*/400**	3
Level II	840*/1200**	630*/1200**	9
Level III	***	***	***
<p>*Minimum Hours in Method</p> <p>**Total Hours in NDT</p> <p>***The level III experience requirements vary significantly for the three documents. Refer to the individual documents for specific requirements.</p>			